MAS BULLETIN

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Metal "Sprayform" Coating of Non-conductive Structures

Background: Chelton (Forming) Ltd., U.K., established in 1964, pioneered development and integration of two technologies--high precision, reinforced plastic molding and metallic coating of plastics. By combining these two technologies, a new generation of high-strength, lightweight structures was developed for the aerospace, defense, nuclear power, and communications industries.

Discussion: Chelton (Forming) "sprayform" techniques enable a wide range of metallic finishes to be applied to the surfaces of nonconductive components and structures.

Typical applications include

- R. F. screening
- Antistatic protection
- Lightning protection
- EMC/EMI shielding.

In this process, a vaporized molten, metallic film is sprayed onto existing nonconductive surfaces following suitable pretreatment (see Figure 1). Thermosctting plastics and thermoplastics such as epoxy, polyester, ABS, polyamide, acetal, and polycarbonate are suitable for the "sprayform" process using either silver-tin, zinc-aluminum, or zinc-copper as a coating.

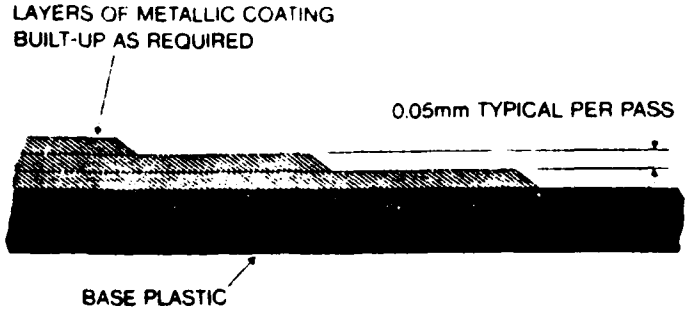

Figure 1. Typical Screening Operation

From Figures 2, 3, and 4, it is apparent from the shielding performances, screening effectiveness, and surface resistance values that the "sprayform" process offers considerable advantages. The performance values are related directly to the thickness and type

Frequency (MHz)	Non Conductive Plastic				Aluminum Die Casting (dB)
	Unsprayed (dB)	Zinc Sprayed			
		0.05mm* (dB)	0.1mm* (dB)	0.15mm* (dB)	
10	37.5	61	60	68	67
30	15.5	51	50	50	49
50	24.5	53	54	58	57
70	22.0	50	50	56	57
90	15.0	46	44	55	54

*Thickness

Figure 2. Relative Shielding Performance

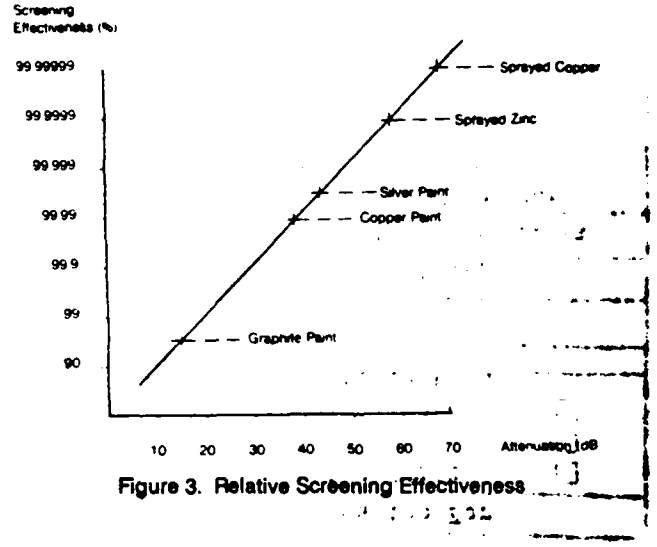

Figure 3. Relative Screening Effectiveness

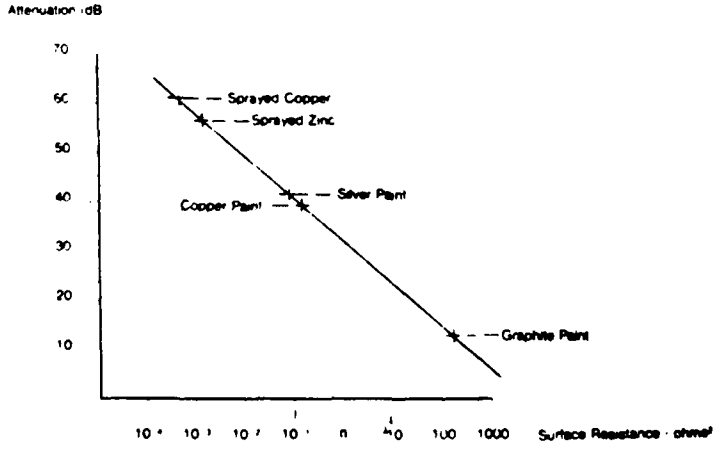

Figure 4. Relative Surface Resistance (at 100 MHz)

of metal coating, which is closely controlled during application to ensure correct value of attenuation.

Coating can be selective. For example, a component requiring areas of partial screening can be masked; and if the component is related to an assembly and requires further screening, the complete assembly can be finally processed. This type of metal sprayform has been applied to a wide variety of RF components and structures to provide very effective ground planes and electrostatic pathways.

In addition to surface coating, Chelton (Forming) "sprayform" techniques are used to fabricate complete metal/plastic composite structures. In this process, a metallic coating is built up around either a reusable or dissolvable high-precision mandrel. The resultant metal "shell" is then reinforced by a glass, "Kevlar," or carbon fiber (graphite)-loaded thermosetting resin casing or backing to provide structural integrity.

The "sprayform" technique provides

- Very high bond strength
- High repeatability
- Accurate control of metal thickness (from 0.15 mm upwards)
- Precision surface finish.

Such sprayform techniques find application in the cost-effective production of lightweight, high-strength components, such as waveguides and microwave feeds, horns, antennas, and dishes.

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